Amendments To The Claims

1-5. (canceled)

6. (previously presented) Apparatus for heart pacing with hemodynamic improvement, comprising:

one or more electrodes, which are adapted to convey electrical signals to respective cardiac muscle segments; and

signal generation circuitry, which applies an extended pacing signal, having an overall duration greater than 8 ms, to the one or more electrodes so as to pace the heart,

wherein the signal has a leading edge and a trailing edge, and wherein the trailing edge is characterized by an absolute rate of voltage change substantially smaller than that of the leading edge.

7. (original) Apparatus according to claim 6, wherein the absolute rate of the voltage change is less than a minimum rate of change necessary to generate an action potential in the cardiac muscle segments.

8-9. (canceled)

10. (currently amended) Apparatus for human heart pacing with hemodynamic improvement, comprising:

one or more implantable electrodes, which are adapted to convey electrical signals to respective cardiac muscle segments; and

signal generation circuitry, which is adapted to apply an extended pacing signal to the one or more electrodes so as to pace the human heart, the extended pacing signal having an overall duration greater than 8 ms from a time of initiation of application of that portion of the signal that initiates action potential propagation,

wherein the extended pacing signal comprises a train of pulses,

wherein the signal has an amplitude that is at least three times as great as a threshold for pacing the heart and that is sufficient neither for cardioversion nor for defibrillation, and

wherein the cardiac muscle segments to which the one or more electrodes are applied are characterized by a refractory period, and wherein the overall duration of the signal is such that the signal terminates during the refractory period.

11. (original) Apparatus according to claim 10, wherein each of the pulses in the train has a pulse duration of at least 1 ms.

12. (original) Apparatus according to claim 10, wherein the pulse train has a period of at least 5 ms.

13. (original) Apparatus according to claim 12, wherein the pulse train has a period of at least 20 ms.

14. (original) Apparatus according to claim 10 wherein the train of pulses comprises a plurality of biphasic pulses.

15. (original) Apparatus according to claim 10, wherein the train of pulses has a duty cycle between about 10% and 50%.

16-54. (canceled)

55. (previously presented) A method for heart pacing with enhancement of cardiac contraction, comprising:

applying one or more electrodes to a subject's heart; and

conveying an extended pacing signal, having an overall duration greater than 8 ms, to the one or more electrodes so as to pace the heart,

wherein the signal has a leading edge and a trailing edge, and wherein the trailing edge is characterized by an absolute rate of voltage change substantially smaller than that of the leading edge.

56. (previously presented) A method according to claim 55, wherein the absolute rate of the voltage change is less than a minimum rate of change necessary to generate an action potential in the cardiac muscle segments.

57-58. (canceled)

59. (currently amended) A method for heart pacing with enhancement of cardiac contraction, comprising:

applying one or more implantable electrodes to a human subject's heart; and

conveying an extended pacing signal to the one or more electrodes so as to pace the heart, the extended pacing signal having an overall duration greater than 8 ms from a time of initiation of application of that portion of the signal that initiates action potential propagation,

wherein conveying the extended pacing signal comprises conveying a train of pulses,

wherein the signal has an amplitude that is at least three times as great as a threshold for pacing the heart and that is sufficient neither for cardioversion nor for defibrillation, and

wherein the cardiac muscle segments to which the one or more electrodes are applied are characterized by a refractory period, and wherein the overall duration of the signal is such that the signal terminates during the refractory period.

60. (previously presented) A method according to claim 59, wherein each of the pulses in the train has a pulse duration of at least 1 ms.

61. (previously presented) A method according to claim 59, wherein the train of pulses has a period of at least 5 ms.

62. (previously presented) A method according to claim 61, wherein the train of pulses has a period of at least 20 ms.

63. (previously presented) A method according to claim 59, wherein conveying the train of pulses comprises conveying a plurality of biphasic pulses.

64. (previously presented) A method according to claim 59, wherein the train of pulses has a duty cycle between about 10% and 50%.

65-150 (canceled)

151. (previously presented) A method according to claim 59, wherein conveying the extended pacing signal comprises modifying a characteristic of pulsatile flow of blood in the heart.

152. (withdrawn) A method according to claim 151, wherein modifying the characteristic comprises increasing a stroke volume of the heart by at least 5% relative to the stroke volume when the heart is paced with pulses less than 2 ms in duration.

153. (withdrawn) A method according to claim 152, wherein increasing the stroke volume comprises increasing the stroke volume by at least 10% relative to the stroke volume when the heart is paced with pulses less than 2 ms in duration.

154. (withdrawn) A method according to claim 151, wherein modifying the characteristic comprises modifying a cardiac output of the heart by at least 5% relative to the cardiac output when the heart is paced with pulses less than 2 ms in duration at a pacing rate equal to that of the extended pacing signal.

155. (previously presented) A method according to claim 151, wherein modifying the characteristic comprises increasing a contractility of at least a portion of the heart by at least 10% relative to the contractility thereof when the heart is paced with pulses less than 2 ms in duration.

156. (withdrawn) A method according to claim 151, wherein modifying the characteristic comprises decreasing a contractility of at least a portion of the heart by at least 10% relative to the contractility thereof when the heart is paced with pulses less than 2 ms in duration.

157. (withdrawn) A method according to claim 151, wherein modifying the characteristic comprises modifying a muscular tension in the heart by at least 10% relative to the tension when the heart is paced with pulses less than 2 ms in duration.

158. (withdrawn) A method according to claim 59, wherein conveying the extended pacing signal comprises modifying the duration of an action potential in the respective cardiac muscle segments by at least 10% relative to the duration when the heart is paced with pulses less than 2 ms in duration.

159. (withdrawn) A method according to claim 59, wherein conveying the extended pacing signal increases a muscular tension in the respective cardiac muscle segments by at least 50% relative to the duration when the heart is paced with pulses less than 2 ms in duration.

160. (withdrawn) A method according to claim 159, wherein conveying the extended pacing signal increases the muscular tension in the respective cardiac muscle segments by at least 100% relative to the duration when the heart is paced with pulses less than 2 ms in duration.

161. (previously presented) A method according to claim 59, wherein applying the one or more electrodes comprises applying a plurality of electrodes in different chambers of the heart.

162. (previously presented) A method according to claim 161, wherein conveying the extended pacing signal comprises conveying a plurality of waveforms respectively to the electrodes in the different chambers according to a predetermined time sequence.

163. (previously presented) A method according to claim 161, and comprising conveying a pacing pulse having a duration less than 8 ms to one or more of the electrodes positioned in a first one of the different chambers, and wherein conveying the extended pacing signal comprises conveying the signal to another one or more of the electrodes positioned in a second one of the different chambers.

164. (previously presented) A method according to claim 59, wherein conveying the extended pacing signal comprises conveying the signal to the one or more electrodes in response to a demand for an enhancement of hemodynamic performance of the heart.

165. (withdrawn) A method according to claim 164, wherein the enhancement of hemodynamic performance comprises an increase in cardiac output.

166. (previously presented) A method according to claim 164, and comprising receiving an output signal responsive to a physiological parameter indicative of the demand for the enhancement, and wherein conveying the extended pacing signal comprises conveying the pacing signal responsive to the output signal.

167. (previously presented) A method according to claim 164, and comprising, in the absence of the demand for the enhancement, conveying pacing pulses to the electrodes of substantially lower energy than the extended pacing signal.

168. (previously presented) A method according to claim 59, wherein applying the one or more electrodes comprises applying electrodes endocardially.

169. (withdrawn) A method according to claim 59, wherein applying the one or more electrodes comprises applying electrodes epicardially.

170. (withdrawn) A method according to claim 59, wherein applying the one or more electrodes comprises applying electrodes transmyocardially.

171. (withdrawn) A method according to claim 59, wherein applying the one or more electrodes comprises applying electrodes transvenously.

172. (previously presented) A method according to claim 59, and comprising receiving an output signal responsive to activity of the heart, and wherein conveying the extended pacing signal comprises modifying the pacing signal responsive to the output signal.

173. (previously presented) A method according to claim 172, wherein receiving the output signal comprises receiving an electrophysiological signal.

174. (previously presented) A method according to claim 173, wherein the electrophysiological signal comprises a Monophasic Action Potential signal.

175. (previously presented) A method according to claim 173, wherein receiving the electrophysiological signal comprises placing a pair of bipolar electrodes in close mutual proximity in contact with the heart and receiving a bipolar signal from the bipolar electrodes.

176. (previously presented) A method according to claim 172, wherein modifying the pacing signal comprises detecting a possible arrhythmic stimulation of the heart and modifying the extended pacing signal so as to prevent the arrhythmic stimulation.

177. (previously presented) A method according to claim 59, wherein applying the one or more electrodes comprises applying electrodes such that conveying the extended pacing signal engenders a redistribution of cardiac muscle mass.

178-204. (canceled)

205. (currently amended) Apparatus for human heart pacing with hemodynamic improvement, comprising:

one or more implantable electrodes, which are adapted to convey electrical signals to respective cardiac muscle segments; and

signal generation circuitry, which is adapted to apply an extended pacing signal to the one or more electrodes so as to pace the human heart, the extended pacing signal having an overall duration greater than 8 ms from a time of initiation of application of that portion of the signal that initiates action potential propagation,

wherein the extended pacing signal comprises a single extended pulse that is either cathodic or anodic,

wherein the signal has an amplitude that is sufficient neither for cardioversion nor for defibrillation, and

wherein the cardiac muscle segments to which the one or more electrodes are applied are characterized by a refractory period, and wherein the overall duration of the signal is such that the signal terminates during the refractory period.

206. (currently amended) A method for heart pacing with enhancement of cardiac contraction, comprising:

applying one or more implantable electrodes to a human subject's heart; and

conveying an extended pacing signal to the one or more electrodes so as to pace the heart, the extended pacing signal having an overall duration greater than 8 ms from a time of initiation of application of that portion of the signal that initiates action potential propagation,

wherein conveying the extended pacing signal comprises conveying a single extended pulse that is either cathodic or anodic,

wherein the signal has an amplitude that is sufficient neither for cardioversion nor for defibrillation, and

wherein the cardiac muscle segments to which the one or more electrodes are applied are characterized by a refractory period, and wherein the overall duration of the signal is such that the signal terminates during the refractory period.

207. (new) Apparatus according to claim 11, wherein the train includes at least two pulses having a duration of at least 5 ms per pulse.

208. (new) A method according to claim 60, wherein the train includes at least two pulses having a duration of at least 5 ms per pulse.

209. (new) Apparatus according to claim 205, wherein the amplitude of the signal is at least three times as great as a threshold for pacing the heart.

210. (new) Apparatus according to claim 205, wherein the single extended pulse is cathodic.

211. (new) Apparatus according to claim 205, wherein the single extended pulse is anodic.

212. (new) A method according to claim 206, wherein the amplitude of the signal is at least three times as great as a threshold for pacing the heart.

213. (new) A method according to claim 206, wherein the single extended pulse is cathodic.

214. (new) A method according to claim 206, wherein the single extended pulse is anodic.